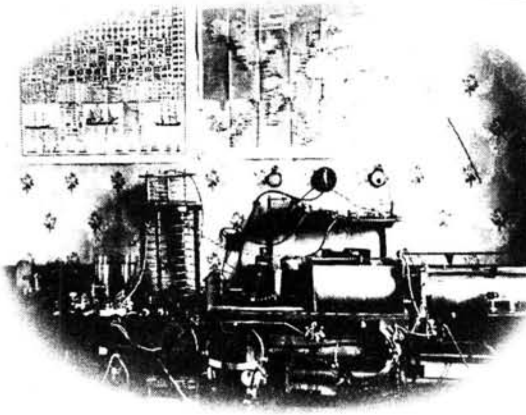


Amateur Wireless Before 1914

by G.R. Jessop G6JP Part 1

Although a few experimenters had started to explore some of the mysteries of wireless earlier, generally it was not until about 1910 that there were any quantity of experimenters. It was also about this time that clubs and societies began to be formed.

Press reports of the latest advances made by Marconi appeared regularly, items also appeared in the *English Mechanic* and the *Marconigraph* (later to become *Wireless World).* Even the Boy Scouts took a very early interest in wireless.

Among the early amateur wireless experimenters quite active in this new science were such people as the well known authors William Le Queux and Rudyard Kipling.

At this period (1910) any person interested in wireless had of necessity to make almost every item, there being few or no suppliers. There were in fact few suppliers of ordinary electrical fittings, for the use of electricity in the home was not yet normal. Most household illumination was by town gas or oil lamp and electric supplies, where they existed, were in no way standardised. Much of the supply was direct current (d.c.) of almost any voltage between 100 and 220 volts, alternating supplies varied similarly in voltage and had different frequencies as well.

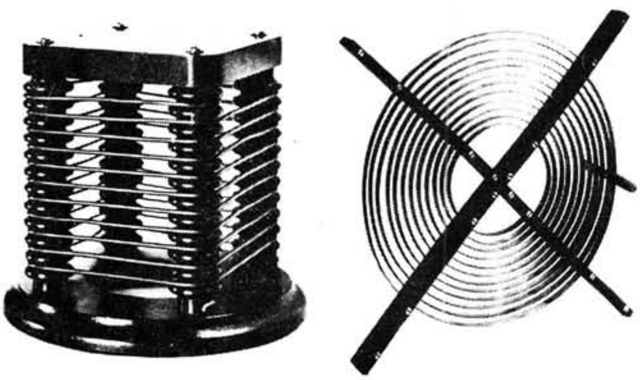


Fig. 1: Early forms of transmitting tuning coils

Travelling in those days was very largely restricted to such public transport that existed. Although most of the railways were operating, motor cars, cycles and buses were yet to arrive in any quantity—the horse drawn bus was still in service in London for example and steam trains were still operating on the Metropolitan and District Railways.

An average experimenter's wireless was a rather primitive affair, the transmitter was one form or other of a simple spark gap or a rotary multipoint gap, connected to a tuned circuit usually loose coupled to the antenna (aerial) tuning circuit. Quite often a single inductor was used with taps connecting to the spark gap and the antenna.

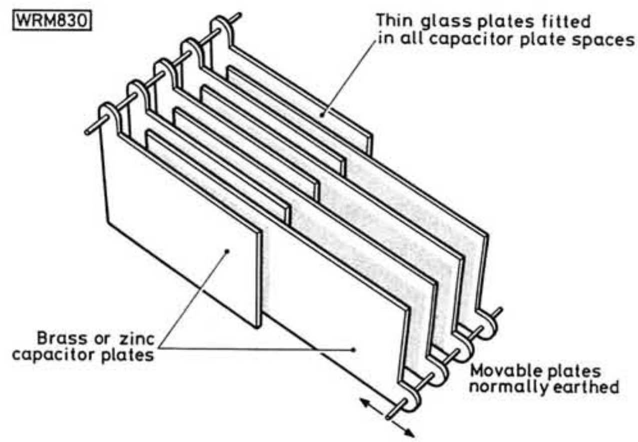


Fig. 2: An early form of adjustable capacitor

The inductance of the tuned circuit took the form of either a large diameter helix or a spiral or pancake (spiders web), wound with heavy gauge wire or ribbon (Fig. 1). The tuning capacitor (condenser) usually consisted of a number of Leyden jars that could be connected in circuit enabling some degree of variability. Ordinary rotary tuning capacitors, if used, had to be fabricated from sheet metal. An alternative consisted of two sets of rectangular plates which could be moved relative to one another. In this type it was usual for sheets of thin glass, such as cleaned photographic plates, to be inserted between intermeshed plates, the capacitor plates being smaller than the glass insulating plates.

The generator was a spark either from a simple pair of electrodes or some form of rotary gap where there were effectively two smaller spark gaps in series set opposite a series of electrodes attached to a rotating disc, the disc being rotated either by a belt or gearing. Some examples of a rotary spark gap are shown in Fig. 3.

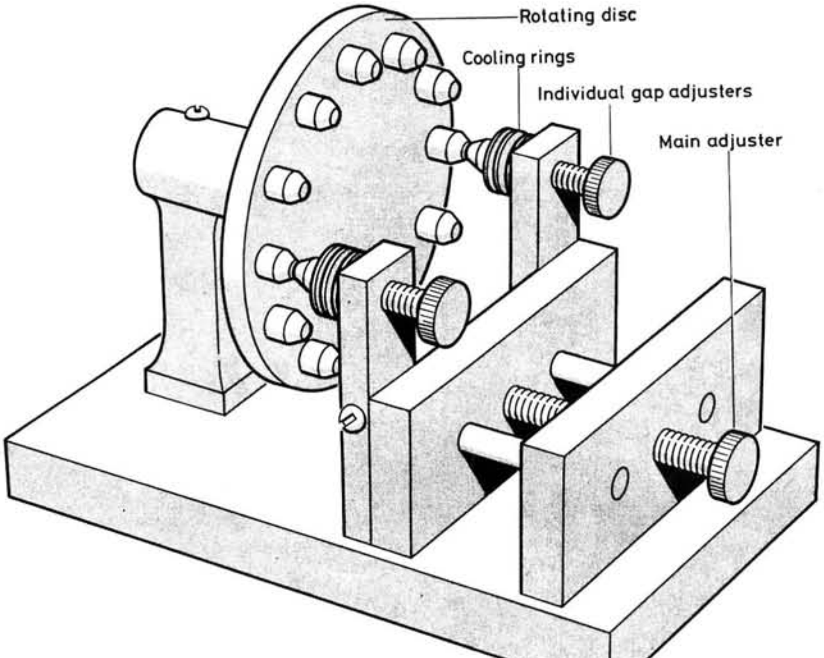
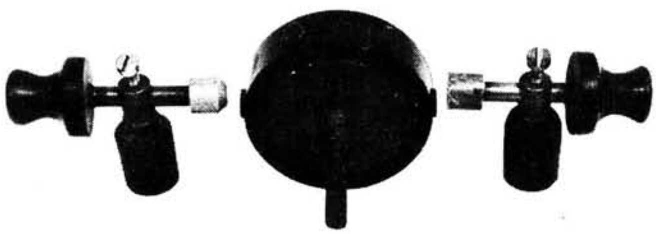


Fig. 3: Two types of rotary spark gap



The voltage supply for the spark gap was normally provided by an induction coil with a make and break set of contacts fed from a suitable battery (the same principle as now used for coil ignition in petrol engines). Almost any form of regular switching of the d.c. supply was applied to the induction coil primary.

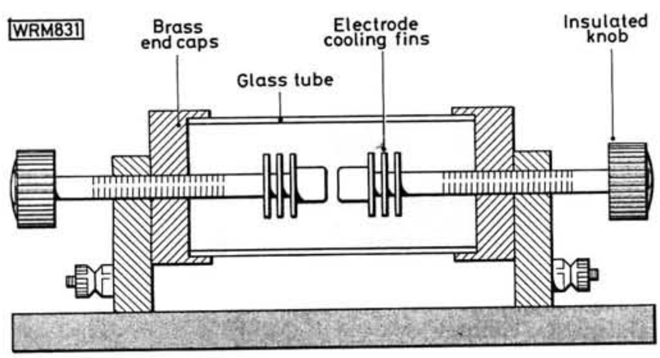


Fig. 4: A simple enclosed spark gap

The rotary spark gap was most often used when the induction coil was supplied from a mains supply, it being a convenient method of driving the gap by small motor.

Any spark gap is very noisy and it was often enclosed in some form of silencing box. A simple spark gap would have been enclosed in some sort of muffler which would have usually consisted of a thick wall tube with close fitting end caps (Fig. 4).

Control of power was always of an elementary nature, in the case of mains supplied induction coils, some form of adjustable (tapped) iron cored inductance was used. Keying the transmitter was of necessity in the primary of the coil as the voltage was lower.

The transmitting frequencies (wavelengths) were quoted to be from about 500kHz–3MHz (600–100m), with power ranging from a few watts up to a quarter of a kilowatt, with working ranges up to approximately 65km.

Antennas were generally large and as high as possible, usually taking the form of an inverted "L" having several wires in parallel held in position by bamboo spreaders. Alternatively a cage formation was preferred by some experimenters. The whole installation was well insulated despite only simple insulators being readily available. In most stations the voltage on the antenna was considerable and so the lead-in had to be well out of reach in case of accident.

On the receiving side the tuning range of the receiver was usually quite extensive, the majority were able to reach 50kHz (6000m) or so, but a few had provision for coverage to 2kHz (15000m) with quoted receiving ranges up to 4000km.

The receiver was essentially a simple crystal detector type, the coherer and magnetic detectors had been replaced by crystal detectors about the time that the majority of experimenters interest was aroused (Fig. 5).

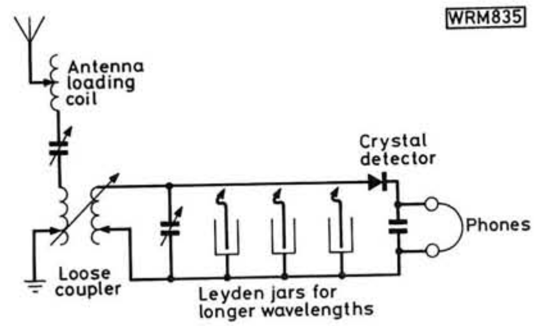


Fig. 5: The circuit of a typical crystal receiver

The antenna loading coil was usually in the form of a large solenoid with a slider for selecting the required inductance for any particular wavelength, these coils were often between 0·6 and 0·9m in length and 88 to 127mm diameter close wound with 18 to 22 s.w.g. enamelled wire, the insulation being scraped off for contact with the slider.

The coupling coils, were either pancake type or more usually a "loose coupler", that is a pair of coils that could slide inside one another, variation of the inductance in circuit being selected by tap switches. Examples of these coils are shown in Fig. 6.

The crystal detector was subject to a great deal of experimentation and ingenuity. In the first place when a transmitter was operated the detector became desensitised and needed re-adjustment after each transmission. Therefore to overcome this particular problem the detector crystals were arranged to be separated either mechanically or magnetically, so that the detector was effectively disconnected during transmission. Crystal detectors arranged for automatic and mechanical disconnection are shown in Fig. 7.

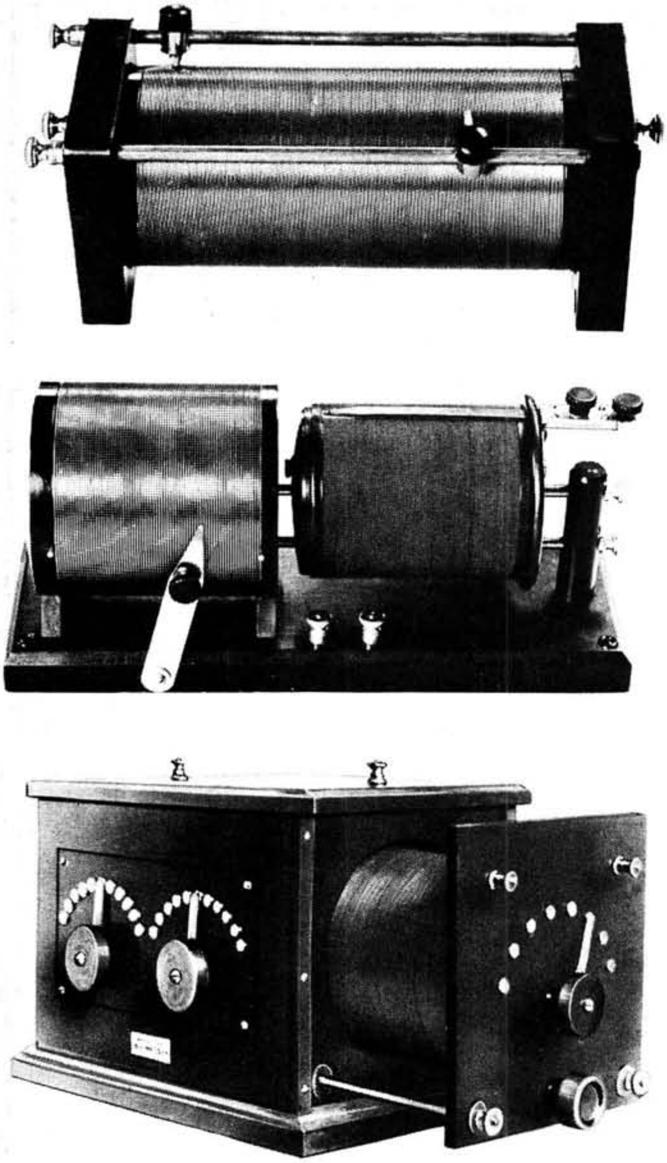


Fig. 6: Three types of receiver tuning coils (a) two-slider inductor (b) loose coupler with slider adjustments (c) loose coupler with tap switches for adjustments

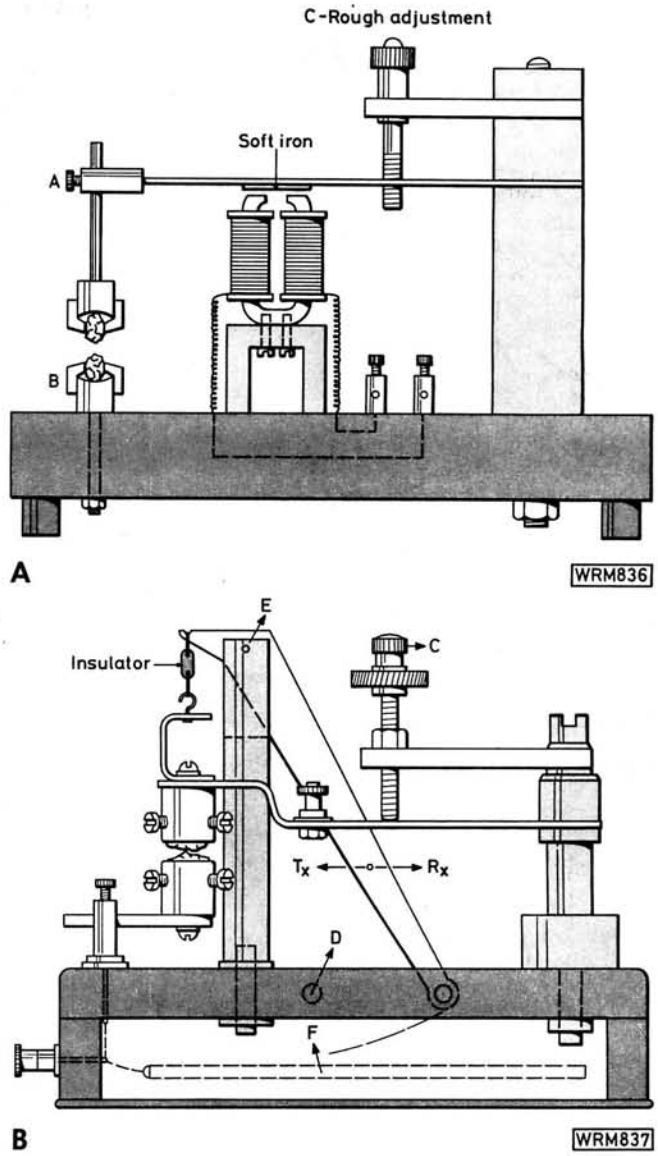


Fig. 7: The Perikon crystal detector arranged for automatic disconnection (a) magnetically operated type (b) mechanically operated type

The Perikon type of crystal detector using two different crystal seems to have been generally preferred, though some used oil immersed point contact (catswhisker) with success and found that such design was largely free from transmitter damage, similarly others favoured the electrolytic detector. In passing it is interesting to note that the experimenters of the period were quite prepared to tackle simple "glass blowing" to seal wires into glass tubes. Platinum wire was usually available from jewellers (platinum being a good match in respect of its thermal expansion to the glass normally available—leadglass).

A wide variety of materials were tried for crystal detectors, among these the following were used fairly widely.

Bornite Carbon Silicide Carborundum Copper Pyrites	Galena Graphite Iron Pyrites Molybdenite	Nicolite Silicon Tellurium Zincite

For double crystal Perikon detectors the following combinations were normally used.

Zincite & Tellurium
Zincite & Copper Pyrites
Zincite & Bornite
Galena & Tellurium
Galena & Graphite

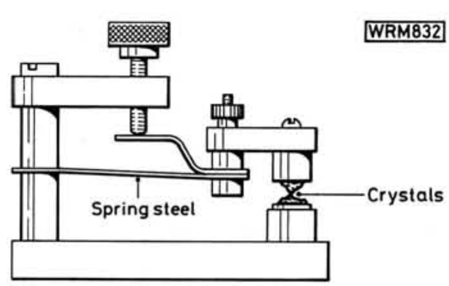


Fig. 8: A Perikon two-crystal detector

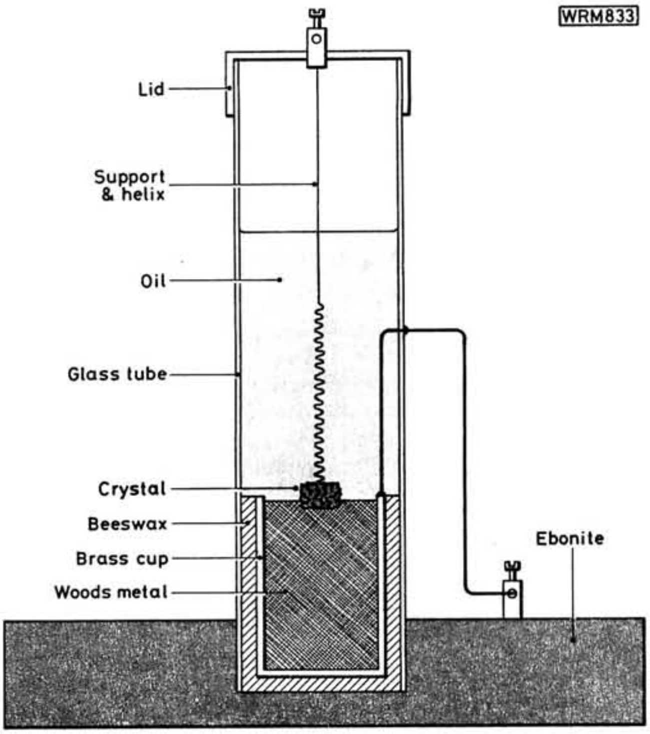


Fig. 9: An example of an oil-immersed point contact detector

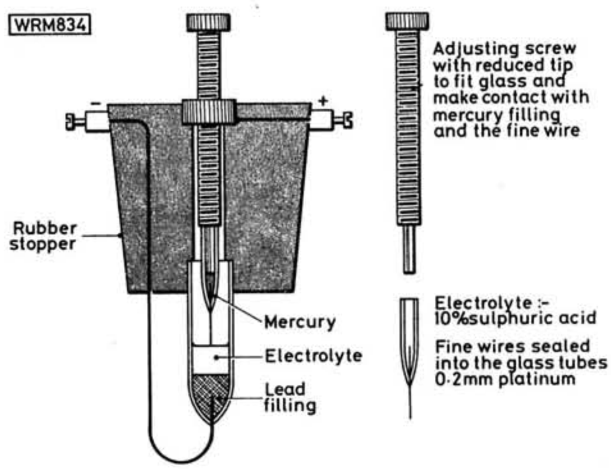


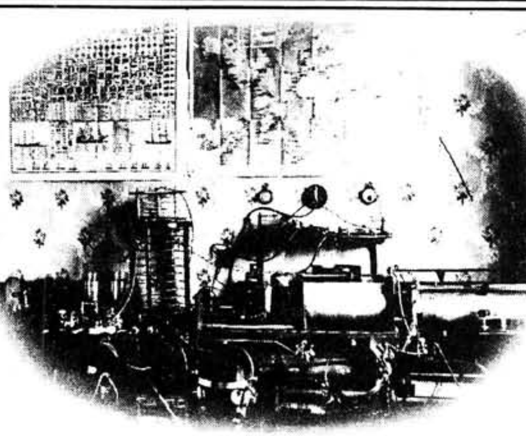
Fig. 10: One design of an electrolytic detector

The most suitable contact metals for single crystal detectors were:

Carborundum & Steel
Galena & Brass
Galena & Copper
Galena & Gold
Galena & Silver
Silicon & Gold
Silicon & Steel
Iron Pyrites & Gold
Molybdenite & Silver

Unlike any other crystal material the carborundum/steel benefitted from the application of a small voltage across the junction, this was usually about 0·8 volts.

Next month we will look at the kind of stations some of the early wireless operators used.



Amateur Wireless Before 1914

by G. R. Jessop G6JP Part 2

Last month we started to look at some of the pieces of equipment that went to make up amateur wireless stations of the day. This month, we continue to look at some actual amateur wireless experimenters and the equipment they used on the air.

Fig. 2.1: Distribution of experimental transmitting stations at the end of 1913

By 14 March 1914 Gamages, who had been in the forefront of supplying components for the wireless experimenters, produced the second edition of their *Directory of Experimental Wireless Stations in the United Kingdom.* This volume showed that some 403 stations had been licensed and a further 365 receiving licences were pending. The map in Fig. 2.1 shows how these were distributed.

It is of interest to note just how widespread amateur wireless activity was in the year before the First World War.

The location of the individual stations, as might be expected, was generally in the areas of industrial activity—although in a few cases they were "out-in-the-country".

It is also interesting to note that the early operations were on widely different wavelengths, the range of transmission was very limited and the power varied from about 5 watts to 500 watts. The level of power was to some extent dependent on the primary source of power—batteries, mains supply or dynamo. This sort of information is shown in the charts of Fig. 2.2.

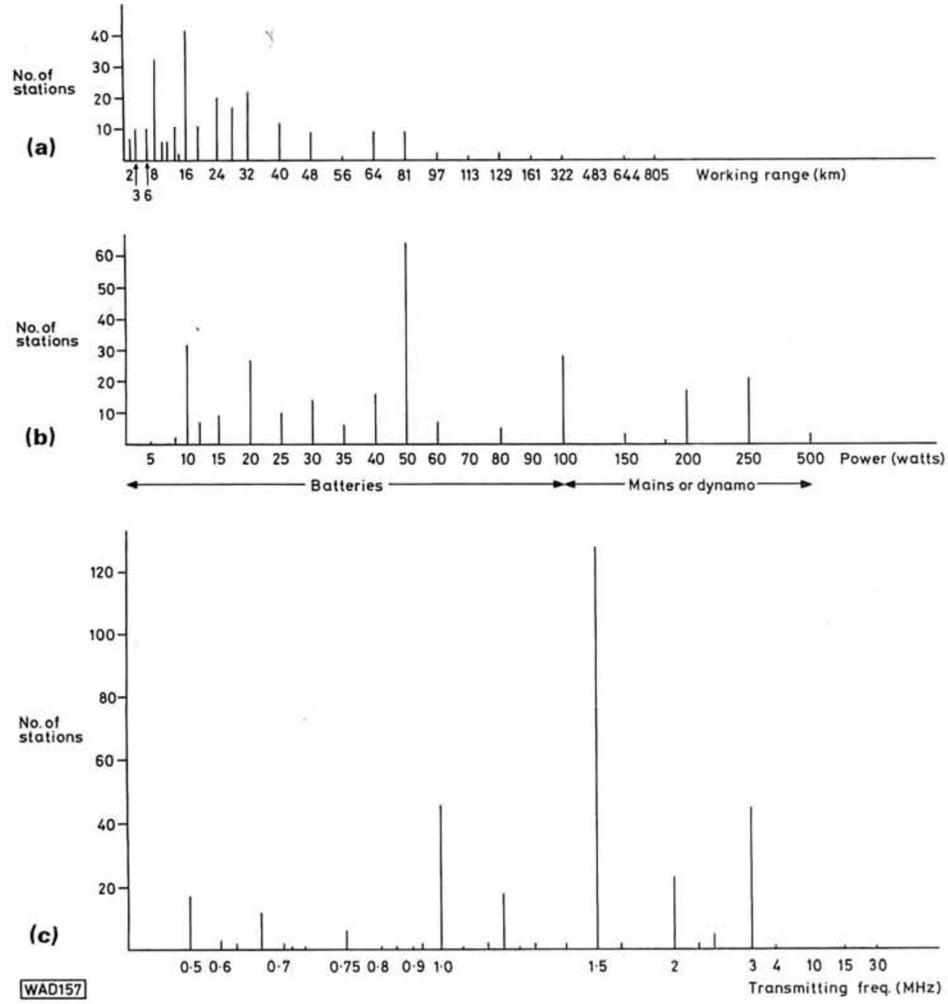


Fig. 2.2

working range (a)

Only a few tens of kilometres were normally achieved, for the majority about 40km or less. No doubt this was to some extent due to low power and insensitivity of the average receiver.

One experimenter, Ken Alford, recalls receiving names of survivors being transmitted by one of the rescue ships at the sinking of the *SS Titanic.* 245 stations analysed.

normal power (b)

As the vast majority of experimenters derived the transmitter power from batteries the power was 100 watts or less. Greater power was obtained from supply mains or local dynamo (such as gas engine driven generator). 273 stations analysed.

wavelength used (c)

Operation was generally over the range 500kHz (600m) to a few megahertz, mainly between 1MHz and 3MHz (300 and 100m). 329 stations analysed.

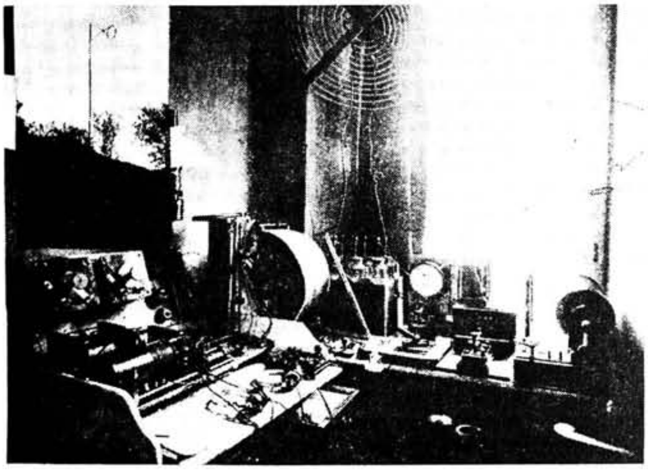
W. K. Alford TXK

later 2DX—October 1913, Kendal

The antenna at this station, situated in the Lake District, was a four-wire cage 43m long. Tuning the transmitter was by a Spider Web spiral coil, together with a bank of nine Leyden jars for tuning.

Power was from a 35V 12A dynamo driven by a gas engine which charged a 14 cell battery to supply the 254mm spark coil.

The receiver detector was a double crystal type using either Zincite/Bornite or Zincite/Tellurium combinations and loose couplers were used for tuning.



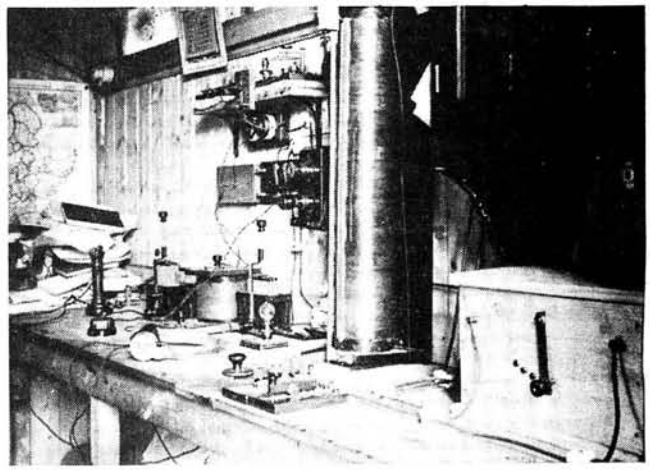
H. W. Pope PZX

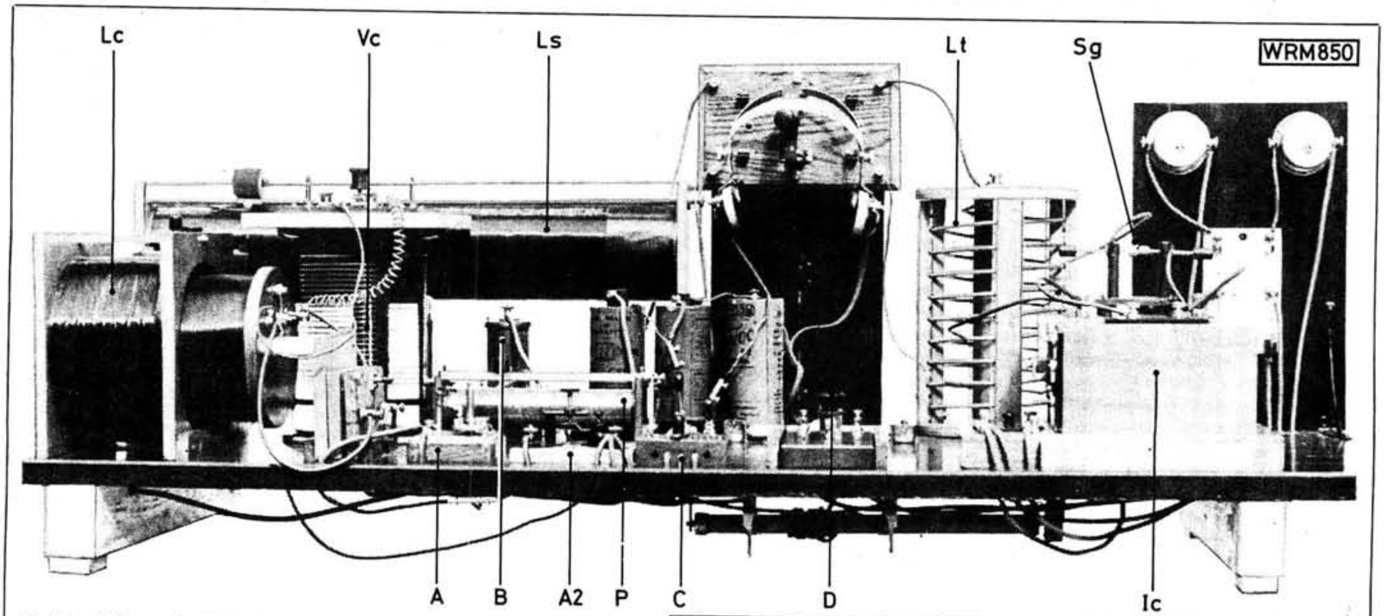
later 3HF—July 1913, London, he was at that time wireless operator of SS *Crown Point.*

The antenna used at this station was 76m long and the power control for the transmitter is shown in the right hand corner of the photograph.

The large vertical inductance is an antenna loading coil for the receiver. It consists of a 609 × 101mm diameter coil wound with 18 s.w.g. wire, fitted with a single slider.

The double crystal detector used the Zincite & Bornite combination with a normal operating frequency of 667kHz (450m).





G. R. Marsh NXJ

later 2IW—Winchester

This station was originally quoted as having a power of 20 watts from accumulators operating on 1·5MHz (200m), with a range of 914km!

The equipment was typical of the pre-1914 period, the transmitter being a simple induction coil (Ic) and spark gap (Sg). Tuning appears to have been accomplished by taps on the coil (Lt). The Morse key is shown at D.

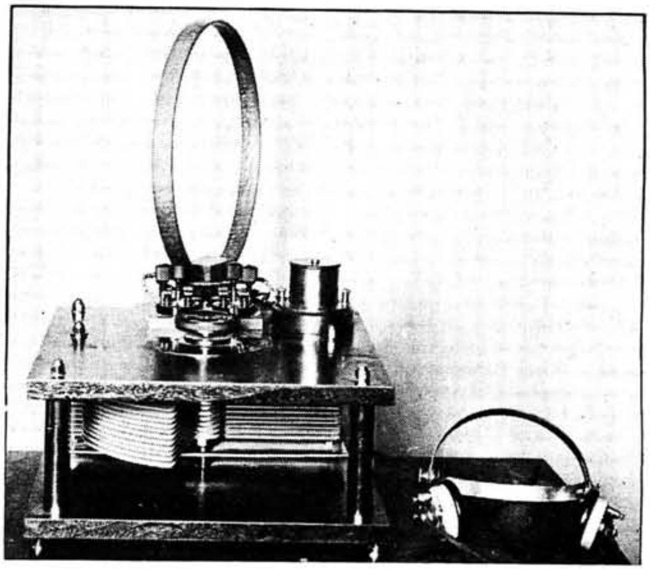
The receiver was fairly comprehensive having the choice of a large slider inductance (Ls) or loose coupler (Lc) together with a large variable capacitor (Vc) for tuning. A selection of detectors were available, a multicrystal Perikon type (A), Perikon detector (A2), Electrolytic type (B) and point contact or carborundum type behind the selector switch (C), voltage control by potentiometer (P) from "bell ringing" dry cells.

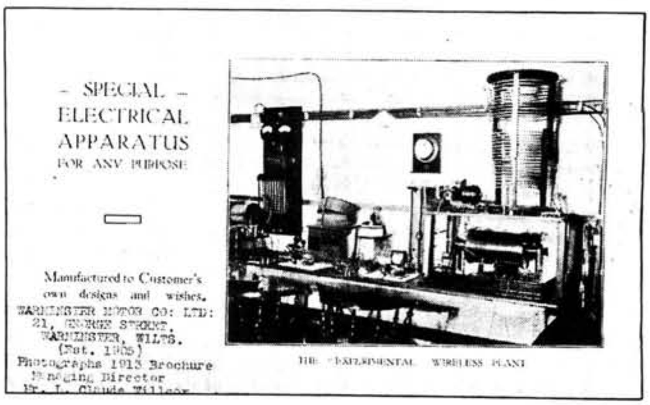
It is clear from the picture that the majority of the items were home constructed.

L. Claude Wilcox WUX

later 2FL—1913, Warminster, Wilts

In this station the power was a quarter of a kilowatt on 500kHz (600m).



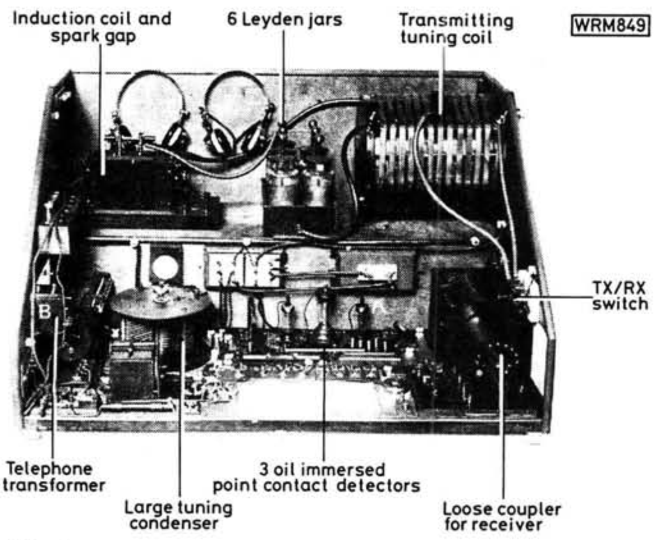


The receiver was tuned by a two-slider inductance and a selection of different detectors, including the popular Perikon type. This photograph was widely known as it appeared on the cover of the Gamages *Directory of Experimental Wireless Stations in the UK*.

F. Cathery

1913—Parkstone, Dorset

This compact transmitter and receiving equipment was housed in a relatively small cabinet, transmitting on a frequency of 3MHz (100m) with low power 5-7 watts derived from dry cells.



L. McMichael MXA*

later 2FG—1913, London

The first wireless experiments he conducted were about 1902, when he succeeded in ringing a single stroke railway signal bell at distances up to 183m using a transmitter with a 203mm spark coil, the receiver detector was a coherer with nickel and silver filings. After a break of some ten years he returned in 1912 to the more advanced state of wireless communication. The transmitter he then used ran up to 150 watts to a 152mm coil on 1·09MHz (275m) with a stated range of 64km.

His receiver was capable of tuning up to 30kHz (10 000m) using a large slider tuned circuit, his crystal detector was a Perikon type, the range of the receiver was stated to be 2414km.

* A founder of the Wireless Society of London 1913.

World War I

At the outbreak of World War I all holders of amateur licences received a telegram from the Post Office. This effectively halted any further amateur experiments for the next few years.

August 1st 1914

To............In accordance with your wireless licence Post Master General requires you to remove at once your aerial wires and disconnect your apparatus. One of his officers will shortly call upon you.

King. Secretary Post Office.

For Your Bookshelf

World at Their Fingertips by J. Clarricoats. This book is now going out of print but no doubt can be obtained either secondhand or from libraries; it was originally available from the RSGB.

The Story of Radio 1–3 by W. M. Dalton. Published by Adam Hilger Ltd.

Early Wireless by Anthony Constable. Published by Midas Books.

A book list of relevant material can be obtained from the Vintage Wireless Co., 64 Broad Street, Staple Hill, Bristol. ●